Future Prairie Prospects in the Puget Sound

By Kyle Reneman

University of Washington Tacoma 1900 Commerce Street
Tacoma, WA 98402-3100

Purpose

Prairies are an uncommon ecosystem in modern western Washington. Of the original habitat, only 3% remain. This has come from anthropogenic processes, including habitat destruction caused from construction and invasive species, and the prevention of forest fires, which has caused fire – dependent prairie systems to become more tertiary evergreen forests. This loss of habitat has caused the northwest prairie, whose ecology is unique to other grasslands, to become exceedingly rare, with several of its members on watch for possible extinction.

(Mima Mounds, a major Washington Prairie with a unusual landscape and ecosystem [1])

The purpose of this project is to consider the possible reimplementation of prairies into the Washington landscape through use of GIS as a spatial analysis tool to survey potential area.

In order to do this, a ecosystems' based approach was used to determine areas which might be practical for restoration efforts. The reason for this is due to the nature of the prairie destruction, which has left it in a severely fragmented state. This fragmentation undermines the remnant prairie by leaving the inhabitants locked into small islands of prairie habitat which can be in limited connection to other prairie patches. This leads to a lack of genetic diversity in the members of that prairie and serves to increase probability of a local extinction event of a species if new members of that species can not reach that particular patch of prairie. Isolation of habitat is a phenomena relevant what species one is considering, so when considering the ecosystem, the potential range a species might travel for new habitat varies considerably from species.

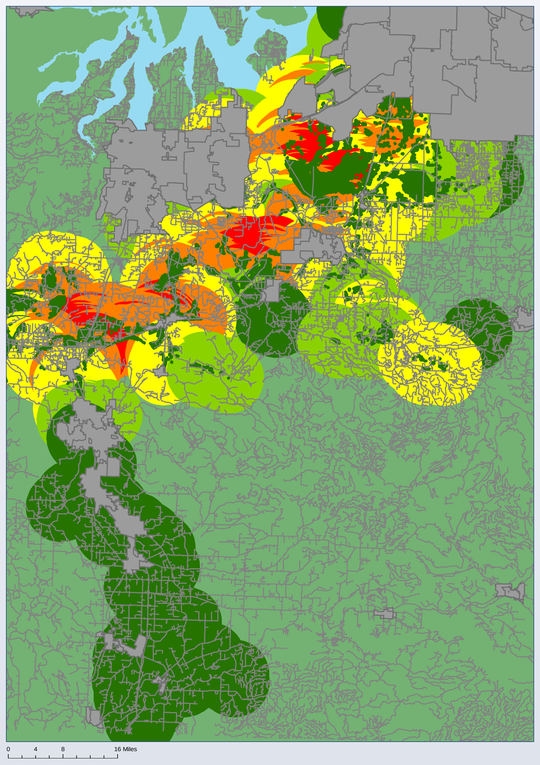
In this study, both human and relationship values were considered. There is also a focus on the endemic species of the area, as well as the monitored. This primarily included the local butterfly (*Lepidoptera spp.*) species, rodent (*rodentia spp.*), and various invertebrate populations.

Objectives

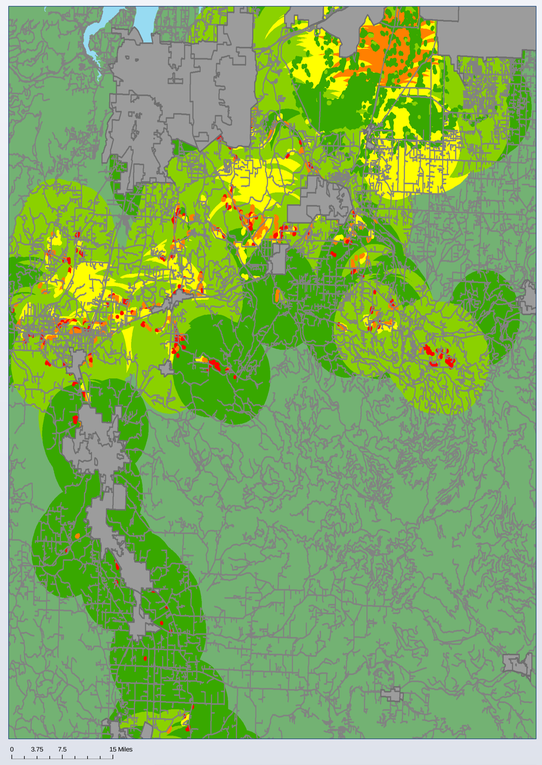
1. To provide an ecosystem based analysis which includes species endemic to this habitat
2. To promote comprehensive planning of habitat development by regarding the surrounding environment that it lies in.
3. To consider how species dispersion is accomplished when made relative to other species dispersion.

Methods and Results

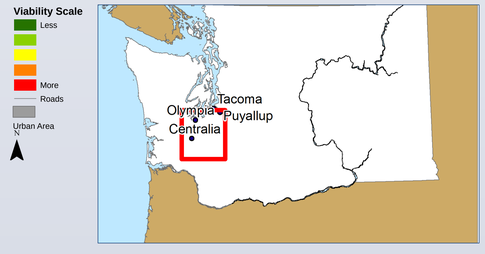
Potential Habitat, normalized for high mobility species



Potential Habitat, normalized for low mobility species



By utilizing Oakland Prairie spatial data, the prairie locations were used in the context of local road density, incorporated urban centers and land imperviousness. By utilizing using potential dispersion values derived from literature of the topic, an index was formed from the species indicative of prairies that are being monitored. In total 15 mammals, butterflies, and terrestrial invertebrates were in the index, and their travel data was applied to find where intersection was most frequent based on urban landscape.



Discussion

The result of this analysis shows that depending on perspective mode of travel, viable area can vary significantly. When the data is normalized for butterflies, the analysis showed regions of area which average 1.1 miles from nearest patch, which is due to the increased range of transit, so the increased extent favors area at a moderate distance. The range for land species is less, with values often less than a few hectares from the original prairie. Transitional area between patches are favored in this normalization due to the species' tendencies to not relocate far when outside the clearing matrix. This leads to abrupt shifts in ideal habitat location, as there are few species endemic to this habitat which have a moderate travel pattern.

The area southwest of Tacoma and Puyallup was heavily favored due to the extreme patchiness of the clearings there, which gave large areas of viable land in order to connect these areas. Butterflies, able to cover the land in a larger area, favored this area more heavily. The area in east unincorporated Centralia served to be better suited for the species with smaller dispersion, possibly due to the lesser urban influence, which made the area more accessible.

Ultimately the end result is that potential area was as sporadic as the current area itself, and presents plenty of opportunity for focused growth of the system.

Conclusion

Should population connectivity be a goal in future restoration projects, it is important to understand that distance and area are factors greatly dissimilar between the species within the ecosystem.

As a recommendation for future research in this field, an analysis of the way endemic prairie species interact with roads when dispersing from their home population would assist in overall understanding of species movement. It would develop the study immensely by considering the probability of a particular species successfully crossing a road of varying human use. Below is an example of some terrain found by the index which might be potential habitat for future development.

An area, located by the index, which could serve as future habitat [2]

References

Image References:

1 http://clui.org/ludb/site/mima-mounds

2 http://maps.google.com/

3 http://www.bentler.us/eastern-

References:

Fahrig L., Gray M. (1985) Patch Connectivity and Population Survival. Ecology 66:1762-1768

Lefkovitch, Fahrig (1985) Spatial Characteristics of Habitat Patches and Population Survival, Ecological Modelling 30:297-308

Loni J. Beyer, Cheryl B. Schultz (2010) Oviposition selection by a rare grass skipper Polites mardon in montane habitats: Advancing ecological understanding to develop conservation strategies Washington State University Vancouver, 14204 NE Salmon Creek Ave, Vancouver, WA 98686, USA

Harrison, Murphy & Ehrlich 1988 American Naturalist 132:360-382.

Acknowledgements

I would like to thank professor Matthew Kelley, for his guidance throughout this project as my GIS instructor, and I would also like to thank professor John Banks for advice regarding how to best express species movement.